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**PATENT  
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Appellants: MIGDAL et al.

Appl. No. : 09/203,894

Filed : December 2, 1998

For : LUBRICANT COMPOSITIONS COMPRISING MULTIPLE  
ANTIOXIDANTS

Attorney Docket No.: UNI018US (D-6361)



Examiner: Hoke, V.

Art Unit: 1714

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**APPELLANTS' BRIEF**

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

The above-identified Appellants submit this Appellants' Brief in triplicate pursuant to 37 C.F.R. § 1.192. The Notice of Appeal was filed on September 20, 2000.

The Commissioner is hereby authorized to charge the official fee of \$310.00 for filing a brief in support of an appeal to Deposit Account Number 21-0525.

The Appellants rely upon the following authorities and arguments to maintain the appeal.

**1. Real Party In Interest**

The real party in interest for this matter is the Appellants' assignee. The assignee and real party in interest is Uniroyal Chemical Company, Inc.

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**2. Related Appeals and Interferences**

There are no other appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**3. Status of Claims**

Claims 1 through 28 were originally filed with the application.

By amendment filed August 7, 2000, Appellants cancelled claims 6, 9, 20, and 23 and amended claims 1, 7, 14, 15, 21, and 28.

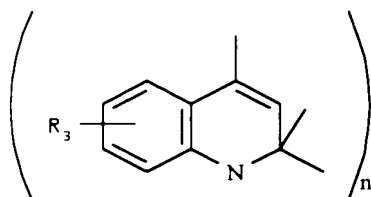
By amendment filed August 30, 2000, Appellants further amended claims 1 and 15.

**4. Status of Amendments**

According to the Advisory Action dated September 7, 2000, the amendments proposed by the Appellants on August 30, 2000 would be entered upon the filing of a Notice of Appeal and an Appeal Brief.

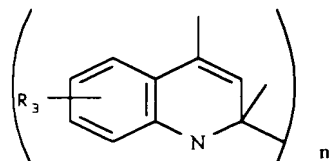
**5. Summary of Invention**

The application on appeal is directed to a composition comprising lubricating oil and at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine of the formula  $R_1-NH-R_2$  where  $R_1$  and  $R_2$  each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof of the structure:



where  $n=1-1000$  and  $R_3$  is hydrogen, alkyl, or alkoxy.

The application on appeal is also directed to a method of increasing the oxidation stability of a lubricating oil comprising adding thereto at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine of the formula  $R_1-NH-R_2$  where  $R_1$  and  $R_2$  each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof of the structure:



where  $n=1-1000$  and  $R_3$  is hydrogen, alkyl, or alkoxy.

This subject matter is supported in the specification on page 3, lines 13 through 21; page 4, lines 14 through 16; and page 6, lines 3 through 12.

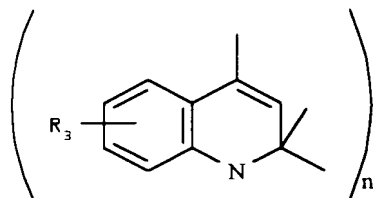
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**6. Issue**

Are claims 1-5, 7, 8, 10-19, 21, 22, and 24-28 obvious over Jones et al. (U.S. Patent No. 2,647,824) taken with Meier et al. (U.S. Patent No. 4,965,006), Evans (U.S. Patent No. 5,246,606), and Rasberger et al. (U.S. Patent No. 4,692,258) under 35 U.S.C. § 103(a)?

**7. Grouping of Claims**

Claims 1-5, 7, 8, and 10-14 are directed to a composition comprising lubricating oil and at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine of the formula  $R_1-NH-R_2$  where  $R_1$  and  $R_2$  each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof of the structure:

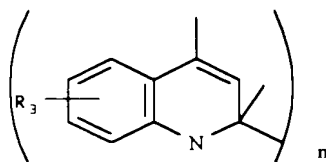


where  $n=1-1000$  and  $R_3$  is hydrogen, alkyl, or alkoxy.

Claims 15-19, 21, 22, and 24-28 are directed to a method of increasing the oxidation stability of a lubricating oil comprising adding thereto at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine of the formula  $R_1-NH-R_2$  where  $R_1$  and  $R_2$  each independently represent a substituted or unsubstituted aryl group having

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from 6 to 46 carbon atoms and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof of the structure:



where  $n=1-1000$  and  $R_3$  is hydrogen, alkyl, or alkoxy.

All the claims of the two rejected groups of claims stand or fall together.

**8. Argument**

**Issue:**

**Are claims 1-5, 7, 8, 10-19, 21, 22, and 24-28 obvious over Jones et al. (U.S. Patent No. 2,647,824) taken with Meier et al. (U.S. Patent No. 4,965,006), Evans (U.S. Patent No. 5,246,606), and Rasberger et al. (U.S. Patent No. 4,692,258) under 35 U.S.C. § 103(a)?**

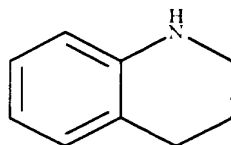
The present invention is directed to a composition comprising lubricating oil and at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof.

The claims on appeal have been rejected under 35 U.S.C. 103(a) as being unpatentable over Jones et al. taken with Meier et al., Evans, and Rasberger et al.

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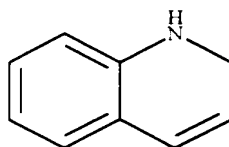
Jones et al. discloses a combination of oxidation inhibitors consisting of a mixture of hydrogenated quinolines and conventional types of oxidation inhibitors. The quinolines employed by Jones et al. comprised those having either the heterocyclic ring or both the heterocyclic and the benzene rings of the compound *saturated* with hydrogen, for example, 1,2,3,4-tetrahydroquinoline and decahydroquinoline. See column 3, lines 1-6.

The basic ring structure of 1,2,3,4-tetrahydroquinoline is:



The second antioxidant of the present invention is 2,2,4-trialkyl-1,2-dihydroquinoline.

The basic ring structure of this compound is:



Thus, the compounds of the present invention have an additional double bond in the heterocyclic ring that is not disclosed or suggested by Jones et al. The claims of the present application particularly point out the structure of the 2,2,4-trialkyl-1,2-dihydroquinolines that are used in the practice of Appellants' invention. Jones et al. simply do not teach such a structure or its use in lubricants.

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None of the secondary references supplement this deficiency of Jones et al. According to the Examiner, Rasberger et al. have taught that 1,2-dihydroquinolines and 1,2,3,4-tetrahydroquinolines are interchangeable. This is in error.

The invention of Rasberger et al. was directed to improving the performance of a particular antioxidant combination: 1,2-dihydroquinolines and phenolics. They found that when 1,2,3,4-tetrahydroquinolines were used *with phenolics*, the combination provided excellent antioxidant action along with satisfactory corrosion behavior. In other words, they did not teach that the 1,2-dihydroquinolines were interchangeable with 1,2,3,4-tetrahydroquinolines, but, rather, that the 1,2,3,4-tetrahydroquinolines were superior to the 1,2-dihydroquinolines *when used with phenolics*.

The Examiner has argued during prosecution that interchangeability is not the same as equivalence; however, she has failed to provide any support for this argument. Webster's Third New International Dictionary (Unabridged) defines "interchangeable" as meaning "permitting mutual substitution without loss of function or suitability." The same dictionary defines "equivalent" as meaning "corresponding or virtually identical esp. in effect or function." It is submitted that these two words are synonymous and that the Examiner's position that there is some significant difference between them - making Appellants' arguments fallacious and erroneous - is clearly untenable.

Rasberger et al. make no mention of 1,2-dihydroquinolines except in the discussion of the prior art in column 1 at lines 22-34. The designation "2,2,4,7-tetramethyl-1,2,3,4-dihydroquinoline" is given in column 2, at line 59, but it is clear from the context that this is a typographical error and that "tetrahydroquinoline" was intended.

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Further, Rasberger et al. do not confirm the present day use of tetrahydroquinolines with diarylamines *or* phenols, as alleged by the Examiner during prosecution. Rather, they teach, as one possibility, the combination of tetrahydroquinolines with diarylamines *and* phenols. See column 4, lines 55 to 69.

Finally, as pointed out above, neither Meier et al. nor Evans disclose using 1,2-dihydroquinolines in combination with a diarylamine; they speak only of the combination of 1,2,3,4- tetrahydroquinolines with various other additives, including diarylamines. The Evans reference, in fact, shows that dihydroquinoline derivatives and tetrahydroquinoline derivatives are patentably distinct. See column 1, lines 9-57.

Additionally, Meier et al. only discloses 1,2,3,4- tetrahydroquinolines wherein the ring nitrogen atom is substituted, i.e., a tertiary amine. The present claims are clearly directed to 1,2-dihydroquinolines in which the ring nitrogen atom is unsubstituted, i.e., a secondary amine.

Thus, none of the cited art discloses or suggests the claimed compositions of the present invention, which comprise a lubricating oil and clearly defined first and second antioxidants, nor does it disclose or suggest a method of using such defined first and second antioxidants to increase the oxidation stability of a lubricating oil.

**9. Conclusion**

The Examiner's cited references fail to disclose or make obvious the composition of, or the process for using, the antioxidant combination claimed by the Appellants. The rejection should be reversed.

Favorable consideration of the application is respectfully requested.



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**10. Appendix**

An Appendix is attached that contains a copy of the claims, as amended, that are involved in the appeal.

Respectfully submitted,

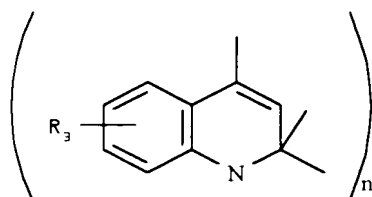
27 October 2000  
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APPENDIX

1. A composition comprising lubricating oil and at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine of the formula  $R_1-NH-R_2$  where  $R_1$  and  $R_2$  each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof of the structure:



where  $n=1-1000$  and  $R_3$  is hydrogen, alkyl, or alkoxy.

2. The composition of claim 1 wherein the lubricating oil is selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, and polyoleates.
3. The composition of claim 1 wherein the lubricating oil is an API Group I base oil.
4. The composition of claim 1 wherein the lubricating oil is an API Group II base oil.
5. The composition of claim 1 wherein the lubricating oil is an API Group IV base oil.

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7. The composition of claim 1 wherein the first antioxidant is selected from the group consisting of diphenylamine, monoalkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butyl diphenylamine, mono- and/or di-octyldiphenylamine, mono- and/or di-nonyldiphenylamine, phenyl- $\alpha$ -naphthylamine, phenyl- $\beta$ -naphthylamine, diheptyldiphenylamine, mono- and/or di-( $\alpha$ -methylstyryl)diphenylamine, mono- and/or distyryldiphenylamine, 4-(*p*-toluenesulfonamido)diphenylamine, 4-isopropoxydiphenylamine, t-octylated N-phenyl-1-naphthylamine, mixtures of mono- and dialkylated t-butyl-t-octyldiphenylamines, N-phenyl-1,2-phenylenediamine, N-phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-phenyl-*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-*p*-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-phenyl-*p*-phenylenediamine.
8. The composition of claim 1 wherein the second antioxidant is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof.
10. The composition of claim 8 wherein the amount of 2,2,4-trimethyl-1,2-dihydroquinoline or polymer thereof is in the range of about 0.01 to about 10 weight percent.
11. The composition of claim 1 wherein the amount of secondary diarylamine is in the range of from about 0.01 to about 10 weight percent.

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12. The composition of claim 1 wherein the ratio the first antioxidant to the second antioxidant is from 1:99 to 99:1.

13. The composition of claim 1 further comprising at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.

14. A composition comprising:

a lubricating oil selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, polyoleates, an API Group I base oil, an API Group II base oil, and an API Group IV base oil,

from about 0.01 to about 10 weight percent of at least one first antioxidant selected from the group consisting of diphenylamine, monoalkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof,

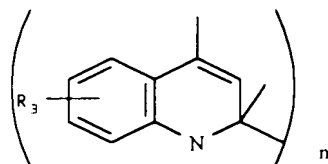
3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butyl diphenylamine, mono- and/or di-octyl diphenylamine, mono- and/or di-nonyl diphenylamine, phenyl- $\alpha$ -naphthylamine, phenyl- $\beta$ -naphthylamine, diheptyl diphenylamine, mono- and/or di-( $\alpha$ -methylstyryl) diphenylamine, mono- and/or distyryl diphenylamine, 4-(*p*-toluenesulfonamido) diphenylamine,

4-isopropoxy diphenylamine, t-octylated N-phenyl-1-naphthylamine, mixtures of mono- and dialkylated t-butyl-t-octyl diphenylamines, N-phenyl-1,2-phenylenediamine, N-

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phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-phenyl-*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-phenyl-*p*-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-phenyl-*p*-phenylenediamine, from about 0.01 to about 10 weight percent of a second antioxidant that is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof, the ratio of the first antioxidant to the second antioxidant being from 1:99 to 99:1, and, optionally, at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.

15. A method of increasing the oxidation stability of a lubricating oil comprising adding thereto at least a first antioxidant and a second antioxidant, the first antioxidant being a secondary diarylamine of the formula  $R_1-NH-R_2$  where  $R_1$  and  $R_2$  each independently represent a substituted or unsubstituted aryl group having from 6 to 46 carbon atoms and the second antioxidant being a 2,2,4-trialkyl-1,2-dihydroquinoline or a polymer thereof of the structure:



where  $n=1-1000$  and  $R_3$  is hydrogen, alkyl, or alkoxy.

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16. The method of claim 15 wherein the lubricating oil is selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, and polyoleates.
17. The method of claim 15 wherein the lubricating oil is an API Group I base oil.
18. The method of claim 15 wherein the lubricating oil is an API Group II base oil.
19. The method of claim 15 wherein the lubricating oil is an API Group IV base oil.
21. The method of claim 15 wherein the first antioxidant is selected from the group consisting of diphenylamine, mono-alkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butyl-diphenylamine, mono- and/or di-octyl-diphenylamine, mono- and/or di-nonyl-diphenylamine, phenyl- $\alpha$ -naphthylamine, phenyl- $\beta$ -naphthylamine, diheptyl-diphenylamine, mono- and/or di-( $\alpha$ -methylstyryl)-diphenylamine, mono- and/or distyryl-diphenylamine, 4-(*p*-toluenesulfonamido)-diphenylamine, 4-isopropoxydiphenylamine, t-octylated N-phenyl-1-naphthylamine, mixtures of mono- and dialkylated t-butyl-t-octyl-diphenylamines, N-phenyl-1,2-phenylenediamine, N-phenyl-1,4-phenylenediamine, N,N'-diphenyl-*p*-phenylenediamine, N,N'-di(naphthyl-2)-*p*-phenylenediamine, N-isopropyl-N'-phenyl-*p*-phenylenediamine, N-(1,3-dimethylbutyl)-N'-

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phenyl-*p*-phenylenediamine, N-(1-methylheptyl)-N'-phenyl-*p*-phenylenediamine, and N-cyclohexyl-N'-phenyl-*p*-phenylenediamine.

22. The method of claim 15 wherein the second antioxidant is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof.

24. The method of claim 22 wherein the amount of 2,2,4-trimethyl-1,2-dihydroquinoline or polymer thereof is in the range of from about 0.01 to about 10 weight percent.

25. The method of claim 15 wherein the amount of secondary diarylamine is in the range of about 0.01 to about 10 weight percent.

26. The method of claim 15 wherein the ratio the first antioxidant to the second antioxidant is from 1:99 to 99:1.

27. The method of claim 15 further comprising at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.

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28. A method of increasing the oxidation stability of a lubricating oil selected from the group consisting of polyol esters, diesters, phthalate esters, trimellitate esters, pyromellitate esters, dimer acid esters, polyoleates, an API Group I base oil, an API Group II base oil, and an API Group IV base oil, comprising adding thereto: from about 0.01 to about 10 weight percent of at least one first antioxidant selected from the group consisting of diphenylamine, mono-alkylated diphenylamine, dialkylated diphenylamine, trialkylated diphenylamine, or mixtures thereof, 3-hydroxydiphenylamine, 4-hydroxydiphenylamine, mono- and/or di-butyl-diphenylamine, mono- and/or di-octyl-diphenylamine, mono- and/or di-nonyl-diphenylamine, phenyl- $\alpha$ -naphthylamine, phenyl- $\beta$ -naphthylamine, diheptyl-diphenylamine, mono- and/or di-( $\alpha$ -methylstyryl)-diphenylamine, mono- and/or distyryl-diphenylamine, 4-(*p*-toluenesulfonamido)-diphenylamine, 4-isopropoxydiphenylamine, *t*-octylated *N*-phenyl-1-naphthylamine, mixtures of mono- and dialkylated *t*-butyl-*t*-octyl-diphenylamines, *N*-phenyl-1,2-phenylenediamine, *N*-phenyl-1,4-phenylenediamine, *N,N'*-diphenyl-*p*-phenylenediamine, *N,N'*-di(naphthyl-2)-*p*-phenylenediamine, *N*-isopropyl-*N'*-phenyl-*p*-phenylenediamine, *N*-(1,3-dimethylbutyl)-*N'*-phenyl-*p*-phenylenediamine, *N*-(1-methylheptyl)-*N'*-phenyl-*p*-phenylenediamine, and *N*-cyclohexyl-*N'*-phenyl-*p*-phenylenediamine, from about 0.01 to about 10 weight percent of a second antioxidant that is 2,2,4-trimethyl-1,2-dihydroquinoline or a polymer thereof, the ratio of the first antioxidant to the second antioxidant being from 1:99 to 99:1, and, optionally, at least one additional additive selected from the group comprising dispersants, detergents, rust inhibitors, antioxidants, metal deactivators, antiwear agents, antifoamants, friction modifiers, seal swell agents, demulsifiers, VI improvers, and pour point depressants.